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Length-weight relationship and relative condition factor (Kn) of freshwater garfish, *Xenentodon cancila* (Hamilton, 1822) from Keenjhar Lake, Thatta Sindh

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Abstract: The study was aimed to report length-weight relationships and relative condition factor (Kn) of the Freshwater garfish, *Xenentodon cancila* collected between January to December 2013 from Keenjhar Lake, Thatta, Sindh. Growth pattern in both of the sexes was determined from 688 individuals (383 ♂, and 305 ♀), ranging 18.3-36.6 cm TL for (males) and 21.5-37 cm for (females), weighing 14.6-145 g (males) whereas females 22-141 g, were recorded.

The coefficient of determination (R^2 = >.8) was for both sexes shows significant relationship between parameters.
Sexual dimorphism was obvious as males possess black edge at dorsal and anal fins whereas females lacks this character. The female-male sex ratio was 1:1.26 deviated from an ideal 1:1. The relative condition factor (*Kn*) ranged from 0.97-0.99. The baseline data presented here would be useful for further studies related to the management of this species.

1. INTRODUCTION

The Needle Nose Gar *Xenentodon cancila* is elongated and thin fish. It swims close to the surface and looks much like stick, so it is sometimes referred to as a Stick fish. Locally this fish is called as Kang. The common name of gar is used because there are similarities between this fish and the true gars. Needlefishes are so-named because of their greatly elongate jaws and bodies. The species is known to survive in wide range of salinity thus it can found in Fresh, marine and brackish water (Hossain *et al.*, 2013).

The distribution includes south Asia (Pakistan, India, Bangladesh, Sri Lanka) and Burma, and Thailand (Talwar and Jhingran 1992 and Baird *et al*., 1999), it is also introduced in Hawaii (Froese and Pauly 2012).

Keenjhar Lake, commonly called as Kalri Lake is situated in the extreme south of Sindh Province, Thatta District, Sindh. This is one of the important water reservoirs for human population of Karachi. Keenjhar Lake is the second largest freshwater lake of Pakistan. It is an important water source that provides drinking water to Thatta District and Karachi City.

The value of *b* near 3 depicts the isometric growth in fish and it suggests that the growth of fish is ideal. On the other hand value of *b* less or above 3 depict algometric growth (Wootton, 1990) There are number of factors which effect the growth including seasonal fluctuations in temperature and change in physiological condition during breeding periods and availability of food (Sinha, 1973). It might also get affected through maturity of gonads, age and the time of year (Tesch, 1968). The values exponent reported for different fish species ranged between 2.5 to 4.0 (Hile, 1936; Martin, 1949) and 2 to 4 (Bagenal and Tesch, 1978; Koutrakis; Tsikliras, 2003 and Achakzai *et al.*, 2015). Sekharan (1998) have observed inter-specific for *b* as remains constant at '3.0' for ideal fish. The growth statistics of cube law might not be applicable for each fish species since the change of shape is caused by an ideal growth (Ali, 1999).

The maximum length (total length) of *X. cancilla* is recorded 30.4 cm (Day, 1878). In Bangladesh longest specimen was documented having total length 26.1 cm (Rahman, 1989). Largest specimen (15 cm) was collected from Bornai River in a field study.

No any research work on *X. cancila* is so far available in Pakistan.

2. MATERIALS AND METHODS

Fish specimens were collected from January to December 2013 at monthly intervals, from fisherman's catches at Keenjhar Lake Thatta.

In laboratory, after cleaning, the measurement of each specimen was undertaken for total length (TL) following standard method. Measuring board was used to measure body length at nearest 0.1 cm. The fish were dried using paper towels and then weight was taken using a digital balance at 0.1 g precision.

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The length-weight relationship (LWR) was calculated as per equation given by Le Cren (1951). W = aLb

In the above equation W is the weight of the fish expressed in grams, L is the total length expressed in cm and *a* and *b* are constant and growth exponent respectively.

A linear relationship was made using logarithmic transformation of data.

$$\text{Log } W = \text{Log } a + b \text{ Log } L$$

The Kn (relative condition factor) was calculated by using the modified formula of Le Cren (1951).
$Kn = W/\hat{W}$,

Where $\hat{W}$ is calculated weight while W is observed weight of the specimens. The Kn for all groups (male, female and combine sexes) were calculated about 3 cm length intervals separately.

3. RESULTS

Descriptive statistics of LWRs and condition of *X. cancila* for combined and separate sexes is given in table 1. Sexual dimorphism was obvious as males possess black edge at dorsal and anal fins whereas females lack this character.

A total of 688 specimens of *X. cancila* (383 male and 305 female) having total length (TL) 18.3-36.6 cm (males) 21.5-37.0cm (females), weighing 14.6-145g (males) while females 22-141 g were used for the study **(Table 1).**

The value of exponent *b* calculated were 3.80, 3.60 and 3.57 for male, female and combine populations respectively.

Sex wise variation of relative condition factor (Kn) were calculated and represented in **(Table 1).**

4. DISCUSSION

The study is based on a total of 688 specimens of *X. cancila* (383 male and 305 female), suggesting that male population dominated over female in number (Table 1). Contrary, (Hossain *et al.*, 2013) collected more females than males of the *X. cancila* from Bangladesh. In fishes dominance of female population over male is a common trend, for instance previously many researcher have reported such trend in various fish species of Indus River and elsewhere (Soomro *et al*. 2015; Achakzai *et al*., 2013; Hossain *et al*., 2013). However the dominance of male over female is a rare phenomenon. Length of largest specimen measured was 37cm. Previously maximum length of *X. cancila* reported from Chi River Thailand was 23cm (Satrawaha and Pilasamorn, 2009), and from Ganges River Bangladesh it was 21 cm (Hossain *et al*. 2013). Maximum length of *X. cancila* in our study is greater than the maximum length of previously reported specimen in same environment; the reason for such differences may be Environmental conditions including pollution, temperature, food availability and fisheries exploitation in the ecosystem (Soomro *et al*., 2012).

Present study resulted positive allometric growth for males, females and combine sex. The calculated values of b for length-weight relationships were higher than isometric growth of the fish (b=3), which were 3.80, 3.60 and 3.57 showing positive allometric growth. The value of b can also be affected by ecological factors. Which comes healthy environment condition just as temperature, pH, light, sex, fishing and breeding (Ricker, 1973). The positive allometric growth in the species indicates that there is sufficient food in aquatic medium. The length and weight were determined separately for combined, male and female population of *Xenendon cancila*. The length and weight relationship also depends on seasonal variations and the fish is unable to maintain the same shape throughout of the

Table 1. Descriptive statistics of Length-weight relationships (LWRs) parameters estimated for *Xenentodon cancila* Male (M), female (F) and combined sexes (C) from January to December 2013.

Sex	*n*	Length range	Weight range	*a*	*b*	r^2	95 % confidence level of *b* *Upper-lower*	*Kn*
M	**383**	**18.3-36.6**	**14.6-145**	**0.0002**	**3.80**	**0.864**	**3.35-3.85**	**0.98-0.99**
F	**305**	**21.5-37.0**	**22-141**	**0.0046**	**3.60**	**0.827**	**3.32-3.3.55**	**0.97-0.98**
C	**688**	**18.3-37.0**	**14.6-145**	**0.0004**	**3.57**	**0.803**	**3.32-3.79**	**0.97-0.99**

year, so there will be changes in slope values. The values of coefficient of determination R^2 were calculated for length weight in male, female and combine sex of *Xenentodon cancila* were 0.88, 0.66 and 0.78, respectively. These values were significant ($p<0.001$). The findings of various researchers suggested that growth is affected by seasonal changes, spawning period and other environmental factors (Sinha, 1973). The growth may also be affected by gonads and age of the fish (Tesch, 1968).

The present concluded that the growth of *X. cancila* n Pakistan waters is ideal.

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